

The Yamagishi Overclock Temperature Equation: Derivation of $kT = \frac{4}{3}\pi v^2$ and Consistency with the Standard Equation of State — 2nd Edition: correction of the v^3 of the first edition — [Paper 20]

Yuuki YAMAGISHI (山岸 勇輝)
Yamagishi Complexity Torus Lab, Japan
July 2026

— *From thinking to syncing.* —

ABSTRACT

We examine the geometric expression of the temperature kT . The argument proceeds in three stages. **Stage 1:** Substituting the Yamagishi kinetic energy $E_k = 2\pi v^2$ (Paper 18) into the equipartition theorem $\langle E_k \rangle = \frac{3}{2}k_B T$ yields $kT = \frac{4}{3}\pi v^2$ in natural units. **Stage 2:** Combining this with the pressure $P = \frac{4}{3}\pi n v^2$ (Paper 19) through the *standard* ideal gas law $P = nkT$, we show the two agree exactly. **Stage 3:** We state the Universe OS clock frequency model.

[Substantive correction in the 2nd edition]: The first edition started from $\frac{3}{2}kT = E_k \cdot v$ and obtained $kT = \frac{4}{3}\pi v^3$. **This is an error and is corrected here.** The standard equipartition theorem reads $\langle E_k \rangle = \frac{3}{2}k_B T$; **there is no operation multiplying the right-hand side by the speed v .** The first edition introduced one extra factor of v .

The correction improves the internal consistency of the theory. With $kT = \frac{4}{3}\pi v^2$, the *standard* form $P = nkT = \frac{4}{3}\pi n v^2$ holds directly and **agrees exactly with the pressure of Paper 19.** The non-standard form $P = nkT/v$ required by the first edition becomes unnecessary (Section 2.3).

The geometric reading "temperature = the volume of a ball in velocity space" is likewise **withdrawn**. Temperature must carry the dimension of energy ($\propto v^2$), not of volume ($\propto v^3$) (Section 2.4).

Scope of this paper: This paper offers a **structural interpretation** of existing physical law. It does not claim the discovery of new physical laws or the proof of open problems. **Note on units:** Substitutions such as $m = 4\pi$ are a **choice of natural units**. G and $\hbar$ are dimensionful; their numerical values depend entirely on the unit system. Setting $G = 4\pi$ is legitimate in exactly the same sense as setting $G = 1$ (geometric units) or $G = 6.674 \times 10^{-11}$ (SI); **physics does not single out one of these as "correct."** What this paper exhibits is therefore **how the equations look in this unit system**, not a new fact about nature. The relations obtained hold in natural units and **require conversion factors when transported to SI.**

Introduction: Unpacking the Temperature kT

The abstractness of "temperature" in conventional thermodynamics

In thermodynamics and statistical mechanics, temperature T is treated as a measure of the mean kinetic energy of molecules, but the geometric content of the product kT has remained unclear.

[2nd edition] On the "ball volume in velocity space" reading

The first edition asserted here that the volume $\text{Vol}(B^3(v)) = \frac{4}{3}\pi v^3$ of the ball of radius v in velocity space (v_x, v_y, v_z) is the temperature kT . That identification is withdrawn in Section 2.4. The derivation below rests on the corrected $kT = \frac{4}{3}\pi v^2$.

Derivation of the Yamagishi Temperature Equation

[2nd edition] Correction in the application of equipartition

Record of correction (a substantive error): The first edition started from

$$\frac{3}{2}kT = E_k \cdot v$$

This is not the equipartition theorem. The standard statement is

$$\langle E_k \rangle = \frac{3}{2}k_B T$$

and there is no operation multiplying the right-hand side by v . The first edition introduced one extra factor of v .

The correct derivation

Theorem (Yamagishi Temperature Equation, corrected)

Under the Yamagishi patch $m = 4\pi$, substituting the kinetic energy $E_k = 2\pi v^2$ of Paper 18 into the equipartition theorem gives

$$\frac{3}{2}kT = 2\pi v^2 \implies kT = \frac{4}{3}\pi v^2$$

Proof. Substitute $E_k = \frac{1}{2}mv^2 = \frac{1}{2}(4\pi)v^2 = 2\pi v^2$ into $\langle E_k \rangle = \frac{3}{2}k_B T$ and solve for kT .

Difference from the first edition: the exponent changes from v^3 to v^2 .

The correction improves consistency (important)

Far from damaging the coherence of the framework, this correction improves it.

Because the first edition adopted $kT = \frac{4}{3}\pi v^3$, connecting it to the pressure $P = \frac{4}{3}\pi n v^2$ of Paper 19 required the **non-standard** equation of state

$$P = n \cdot \frac{kT}{v}$$

The ideal gas law is properly $P = nk_B T$ (with n the number density); dividing by v is not standard.

In the corrected version, **the standard equation of state holds as it stands:**

$$P = n kT = n \cdot \frac{4}{3}\pi v^2 = \frac{4}{3}\pi n v^2$$

which **agrees exactly** with the pressure of Paper 19.

	1st edition	2nd edition (corrected)
Temperature	$kT = \frac{4}{3}\pi v^3$	$kT = \frac{4}{3}\pi v^2$
Equation of state	$P = nkT/v$ (non-standard)	$P = nkT$ (standard)
Agreement with Paper 19	requires correction	exact

In short, applying equipartition correctly makes the standard ideal gas law hold automatically. The v^3 of the first edition sacrificed this consistency in order to obtain a geometric reading (the volume of a ball in velocity space).

[2nd edition] Correction of the geometric interpretation

The first edition identified $kT = \frac{4}{3}\pi v^3$ with "the volume $\text{Vol}(B^3(v))$ of a 3D ball in velocity space." **This identification is also withdrawn.**

In the corrected $kT = \frac{4}{3}\pi v^2$, the coefficient $\frac{4}{3}\pi$ is indeed the volume of the unit ball, but **the factor is v^2 , so the expression as a whole is not a volume.** Dimensionally as well, temperature must carry the dimension of energy ($\propto v^2$), not of volume ($\propto v^3$).

Hence the reading "temperature = the volume of a ball in velocity space" does not hold. All that can be said is that the unit-ball volume $\frac{4}{3}\pi$ appears as a coefficient, and this arises from combining $m = 4\pi$ with the $\frac{3}{2}$ of equipartition,

$$\frac{2}{3} \times 2\pi = \frac{4\pi}{3},$$

independently of any geometry of velocity space.

Algebraic Consistency with the Ideal Gas Law

Proposition (Consistency of Papers 18, 19 and 20)

Paper 18 (kinetic energy $E_k = 2\pi v^2$), Paper 19 (pressure $P = \frac{4}{3}\pi n v^2$) and the present paper (temperature $kT = \frac{4}{3}\pi v^2$) are consistent through the *standard* ideal gas law $P = nkT$:

$$P = nkT = n \cdot \frac{4}{3}\pi v^2 = \frac{4}{3}\pi n v^2,$$

the right-hand side agreeing **exactly** with the pressure of Paper 19.

[2nd edition correction]: The first edition of this section took $kT = \frac{4}{3}\pi v^3$ and used the non-standard form $P = n \cdot \frac{kT}{v}$. **Both have been withdrawn** (Sections 2.2 and 2.3). In the corrected version **the standard form $P = nkT$ holds directly**, so no division by v is needed.

The first edition's language of a "Grand Unification Theorem of Thermodynamics" and "complete closure" is also withdrawn. What is shown here is the **algebraic consistency of three expressions**, not a unification of thermodynamics.

Universe OS Clock Frequency Model

Regarding the mean speed v as a "clock frequency" of the Universe OS, an increase in v corresponds to an increase in the thermal load $kT = \frac{4}{3}\pi v^2$.

[2nd edition correction]: The first edition wrote of "expanding the ball volume $\frac{4}{3}\pi v^3$ in velocity space", but **the volume reading was withdrawn in Section 2.4**. kT is proportional to v^2 . This section is moreover **a metaphor, not a quantitative model**.

Conclusion

Substituting the $E_k = 2\pi v^2$ of Paper 18 into the equipartition theorem $\langle E_k \rangle = \frac{3}{2}k_B T$, we obtain

$$kT = \frac{4}{3}\pi v^2.$$

The first edition's $kT = \frac{4}{3}\pi v^3$ misapplied equipartition and is corrected (no operation multiplies the right-hand side by v). **The correction improves consistency**: the standard form $P = nkT$ holds directly and agrees exactly with the pressure of Paper 19, so the non-standard $P = nkT/v$ required by the first edition is no longer needed.

The reading "temperature = the volume of a ball in velocity space" is withdrawn as well. Temperature must carry the dimension of energy ($\propto v^2$), not of volume ($\propto v^3$). The coefficient $\frac{4}{3}\pi$ arises from combining $m = 4\pi$ with the $\frac{3}{2}$ of equipartition, $\frac{2}{3} \times 2\pi$, independently of the geometry of velocity space.

Independent corroboration (established in the third review): Applying equipartition to the $E_k = 2\pi v^2$ of Paper 26 (reformulation of classical mechanics) gives $kT = \frac{2}{3}E_k = \frac{4}{3}\pi v^2$, **in exact agreement with the correction made here** (verified numerically at $v = 0.5, 1, 2, 3.7$). **The framework of Paper 26 can never yield v^3 .** In this sense the present correction is independently supported.

References

1. Maxwell, J. C. (1860). *Illustrations of the Dynamical Theory of Gases*. Phil. Mag. 19, 19.
2. Yamagishi, Y. (2026a). *The Uniqueness Theorem of $n=2$* . Zenodo.
3. Yamagishi, Y. (2026c). *The Yamagishi Kinetic Energy Equation* [Paper 18]. Zenodo. 10.5281/zenodo.21430706
4. Yamagishi, Y. (2026e). *The Yamagishi Spherical Compression Pressure Equation* [Paper 19]. Zenodo. 10.5281/zenodo.21600912
5. Yamagishi, Y. (2026z). *The Yamagishi Classical Mechanics Reformulation* [Paper 26]. Zenodo. 10.5281/zenodo.21601339

— *From thinking to syncing.* —

Yuuki YAMAGISHI (山岸 勇輝)